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 TOP SECRET COMIREX-D-15.271

MEMORANDUM FOR: Committee on Imagery Requirements and Exploitation

SUBJECT: MC&G Requirement for Image Forming Satellites

REFERENCE: COMOR-D-13/65 dtd 11 July 1966

25X1

1. Attached for consideration at the COMIREX meeting on 10 August is a memorandum forwarded to the Chairman by the Chairman, MC&GWG on 24 July. [] memorandum requests that NRO be tasked with certain problems. The underlying premise of the MC&GWG request is that:

a. The world-wide geodetic requirement as stated in July 1966 continue to be essential to the efficient use of weaponry; and

b. Predicated on the continuing validity of the requirement and the apparent inability of satellite collection systems, as presently designed, to meet them, NRO should study how to reconfigure systems to meet the MC&G requirement.

2. Whereas the attached is quite specific in nature, members may consider it timely to review the total impact of MC&G requirements on satellite reconnaissance.

25X1

NRO review(s) completed.

[]
 Executive Secretary

Committee on Imagery Requirements and Exploitation

Attachment:

Subject paper

25X1

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5, 6, 7, 8	DIA TCO
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 Copy 29 of 61

25X1

25X1

25X1

TOP SECRET

COMIREX-D-15.2/1

MC&G Requirements for Image Forming Satellites

1. The purpose of this memorandum is to summarize results of DoD data reduction activities involving the use of satellite photography toward meeting world-wide geodetic requirements, and to set forth an up-to-date course of action.

2. In COMOR-D-13/65, world-wide geodetic position requirements were stated as 450 feet horizontal and 300 feet vertical, 90% assurance, with respect to the World Geodetic System. These requirements were validated by the Department of Defense to fulfill the needs of advanced weapons systems, primarily long range missiles, and to establish a basic geodetic control network suitable for producing general coverage maps and charts. For the past 2 to 3 years, geodetic programs have been carried out using satellite photography, principally the DAFF photography

25X1

[redacted] toward meeting the world-wide requirement. It was estimated a year ago that the data derived from DAFF materials, which covers 44 million square miles, when integrated with existing geodetic measurements, would provide geodetic accuracy to within 750 feet, 90% assurance, by 1968. It was further estimated that by 1970, refined horizontal accuracies of 450 feet and vertical accuracies of 300 feet would probably be achieved, but could not be assured. These figures were based on a mathematical refinement combining [redacted] DAFF products with applicable data from overt U.S. geodetic satellite programs

25X1

TOP SECRET

25X1

with the world primary triangulation network and the 5-year gravity program. Gaps in DAFF photography were to be filled in by bridging photography from existing covert systems. These estimates and the basis for them were included in COMOR-D-13/65.

3. The five DAFF missions (which were all that were suitable for worldwide geodetic reduction) have been reduced on an individual basis, principally by the Army. An initial consolidation of the missions has recently been accomplished in an effort to establish an accurate and consistent control network. The consolidated reduction was accomplished by the Army, working closely with the Air Force, and with assistance from the Navy. Neither the single orbit reduction or the consolidated reduction have met the preplanned objective of 750 feet, 90% assurance. Instead, it is now estimated that the DAFF data, combined with existing overt U.S. satellite programs, is capable of providing accuracies of only 1000 feet in the northern hemisphere and 1500 feet in the southern hemisphere by 1968. Principal reasons for failing to meet the 750 feet objective are (1) scale and resolution of the DAFF materials, (2) uncertainties in the gravity model, (3) uncertainties in the atmospheric drag model and vehicle thrust parameters and (4) quality of the control data which was used in orbit determination. The errors of the camera system (mensuration and attitude) are estimated to be about 420 feet, 90% assurance. Outside the Sino-Soviet bloc it is possible through control densification programs from overt systems to compensate for the major

25X1

discrepancies in the gravity and atmospheric drag models. However, the most critical area which is located inside the Sino-Soviet area, cannot be given the same control densification and is likewise subject to larger innaccuracies, due to uncertainties in the gravity and drag model.

4. Assuming the completion of planned overt programs, it is probably possible to meet the 750 feet objective, 90% assurance, with the DAFF materials on a world-wide basis. This would involve extensive densification programs by overt systems outside the Sino-Soviet area, and within the Sino-Soviet area special multiple short-arc techniques would be used which would eliminate some of the problems caused by the gravity and atmospheric model, as well as vehicle thrust uncertainties. However, it is certain that the presently validated requirements of 450 feet horizontal and 300 feet vertical cannot be met, principally due to the limitations of the photographic materials, i. e., DAFF. The contribution to be made by the 3" SI on the J-3 package has not been determined.

5. The world-wide geodetic requirement is the same as stated in COMOR-D-13/65, i. e., 450 feet horizontal and 300 feet vertical, 90% assurance, with respect to the World Geodetic System by 1970. The current, and the validated 1968 requirements are appreciably less stringent. Currently, reviews are being made which could result in some changes in these values within the next three to six months. Since there are tradeoffs that can be made in the accuracy requirements of components of the geodetic and geophysical slice of missile CEPs, the cost and time considerations

25X1

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TOP SECRET

are significant factors in the actual accuracy requirements, validated for horizontal and vertical positioning. These tradeoffs encompass overt geodetic and geophysical programs under continuous review within the Department of Defense.

6. The MC&G utilization community will continue to examine and evaluate other approaches to the world-wide positioning problem.

7. It is requested that (a) the NRO be informed of the limitations of existing satellite data to meet world-wide positioning requirements as set forth above, (b) action be taken to ask NRO to study steps within the field of covert satellite systems that would meet the world-wide positioning requirement by 1970, including cost, development, and effects that each proposal would have on the primary system activities, (c) NRO consult with the technical representatives of the COMIREX MC&G Working Group from the standpoint of evaluating alternate acquisition approaches from the data reduction and achievable accuracies point of view, and for coordination with planning and review of overt geodetic systems and programs, and (d) cost and time considerations for NRO solutions for meeting the requirement be presented for review and evaluation against alternate accuracy requirement levels for the horizontal and vertical positioning component of the geodetic and geophysical slice.

/S/

Chairman
COMIREX MC&G Working Group

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